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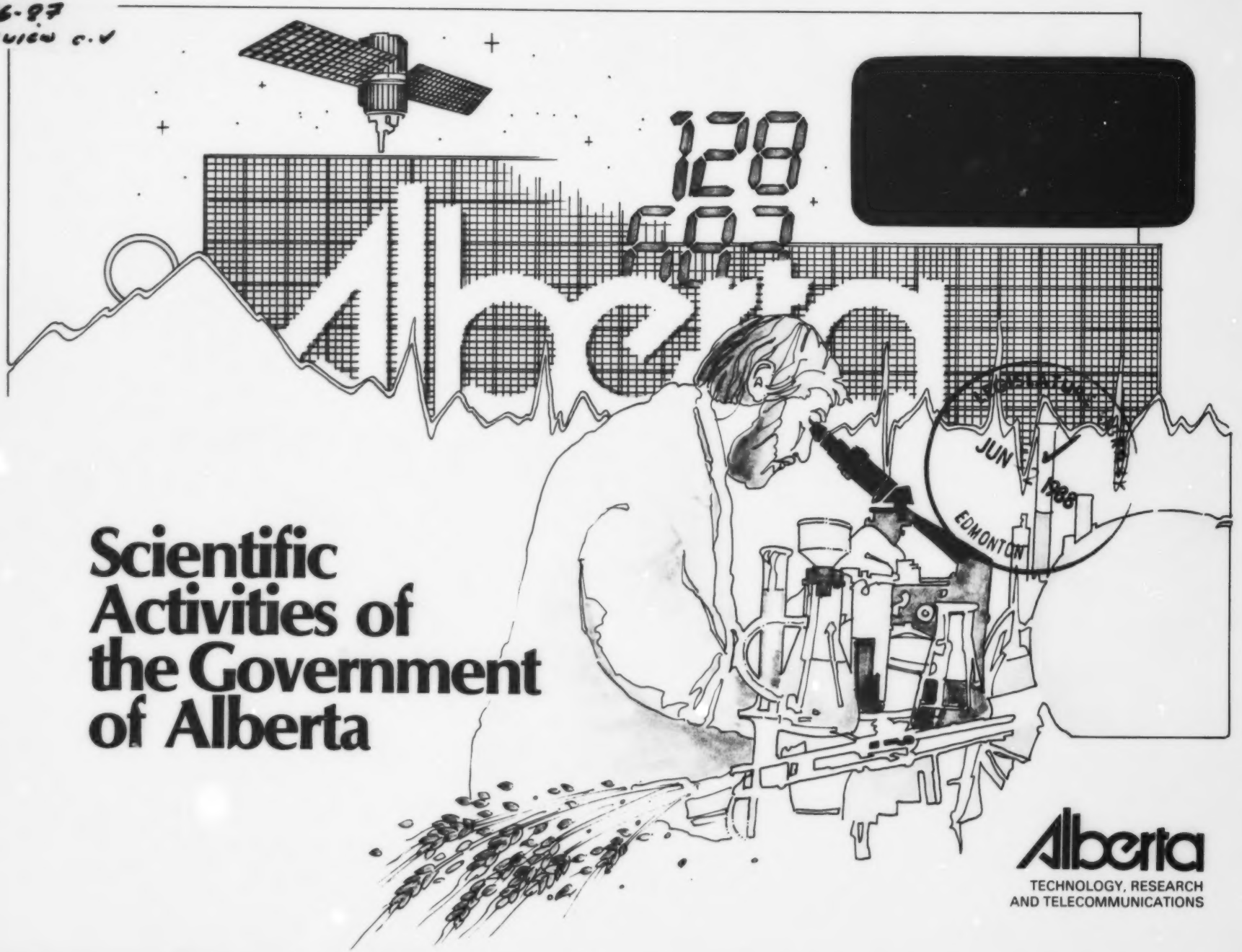

Scientific Activities of the Government of Alberta

Alberta
TECHNOLOGY, RESEARCH
AND TELECOMMUNICATIONS

1986 - 87
OVERVIEW

I. INTRODUCTION

This publication is intended as a brief overview of the Government of Alberta's resource commitment to scientific activities and trends relating to that commitment. All data is extracted from the annual survey of government departments and agencies conducted by Statistics Canada, under contract to Technology, Research and Telecommunications (TRT). On its own, this survey offers a series of indicators of provincial government expenditures, the allocation of those expenditures, human resources, and provincial priorities/objectives in the scientific arena. These provincial indicators can provide significant input to policy formulation and program evaluation when used in conjunction with the indicators generated from companion surveys (to be published at a later date), in particular those relating to the federal government, the private sector, universities, and private nonprofit institutions.

The term "indicator" above is used deliberately. Specifically a number of problems exist with data relating to science activities, including: definitions, year-to-year consistency and measurement. Consequently, the reader should be alerted to an estimated confidence interval of ± 15 percent. It should also be noted that surveys involving different respondents (ie. funders vs performers) can yield substantially different results. While Technology, Research and Telecommunications and Statistics Canada are working to resolve these limitations, and, while the data does offer reasonable order of magnitude estimates, caution is urged in drawing conclusions which exceed the rigor of the data.

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II. TOTAL EXPENDITURES — 1986/87

TABLE I

TOTAL GOVERNMENT OF ALBERTA EXPENDITURES ON SCIENTIFIC ACTIVITIES (by performer)

Performer	FY 81/82 $ (millions)	FY 86/87 $ (millions)	Average Annual Growth (%)
Intramural	53.5	83.5	9.3
Industry	43.0	91.3	16.3
University	22.9	91.2	31.8
Hospitals & Health Care	12.8	18.7	7.9
Alberta Research Council	27.8	33.6	4.0
Other	5.5	10.9	14.7
	165.4	329.4	14.8

As indicated in the foregoing table, total Government of Alberta expenditures on scientific activities increased to $329.4 million in 1986-87. As compared to total expenditures of $165.4 million five years earlier, this represents an average annual growth rate of 14.8 percent. All performing sectors shared in the increase in government expenditures over the 1981/82 to 1986/87 period but industry and the universities clearly emerged as the focal point of government science policy, enjoying average annual funding increases of 16.3 and 31.8 percent respectively. Indeed, each of these two performing sectors was recipient of slightly over one-quarter of total government science expenditures, a marginal increase over the 81/82 share for industry but a virtual doubling in share for the universities. By contrast, the share of expenditures attributable to intramural activities and the Alberta Research Council (ARC) declined significantly over the five year period (32.3 to 25.3 percent and 16.8 to 10.3 percent respectively).

Concerning the provincial government's commitment to science activities as reflected by these data, it is of interest to note that in 1981/82, the $165.4 million in total expenditures constituted roughly 2.3 percent of the Province's budgetary revenues. The 1986/87 expenditures of $329.4 million represent nearly 4.6 percent of budgetary revenues, twice the relative expenditure. Clearly, then, an implied priority for scientific activities is defined relative to the Province's fiscal capacity.

III. COMPOSITION OF EXPENDITURES AND PERFORMERS

A common practice in science and technology statistics is to differentiate between research and experimental development (R&D) and related scientific activities (RSA). RSA is an umbrella term for an array of ancillary information services such as technical/statistical surveys, feasibility studies, testing and standards calibration, and demonstration projects. The creation of prototypes and pilot plants are included in RSA when they are used to ascertain commercial operating characteristics and costs of an innovation.

The annual survey tracks the flow of public funds to performers and the relative R&D and RSA undertaken by them. Table II depicts the 86/87 pattern of scientific activities.

Note the emphasis on R&D, about 76% of the annual provincial government science dollars were allocated to R&D. It is clear from Table II that the industry and university sectors are the predominant performers of R&D; the provincial government is essentially a funder of this activity.

The situation is reversed for RSA which emerges as primarily an intramural activity; 78% of the dollar value of RSA is performed by government departments and agencies.

As alluded to in Table I there has been a three-fold increase in absolute expenditures of the provincial government on scientific activities. The growth has been concentrated in R&D activities: in 81/82, about 63% of current science expenditures were allocated to R&D compared to 76% in 86/87.

Significantly, the expansion in R&D funding was channelled to the university performers. This shift among performers is illustrated in Figure I. The more than triple increase in University performed R&D is a trend of provincial government expenditures in the '80s. While the absolute dollar value of R&D performed by other sectors has grown over the five-year period, their share of publicly funded R&D has not. There is a noticeable decline in the proportion of R&D contracts and grants executed by the Alberta Research Council and the hospitals sector. Industry is performing about the same proportion of government funded R&D.

With regard to RSA, it has become more concentrated as an intramural activity, from 67% in 81/82 to 78% in 86/87. Industry performed RSA has dropped in absolute value as well as proportionally. Contracts and grants to industry for RSA in 86/87 were 60% of the dollar value of the 81/82 contracts, representing 11.3% of government funded RSA in 86/87 compared to 26.3% in 81/82.

TABLE II

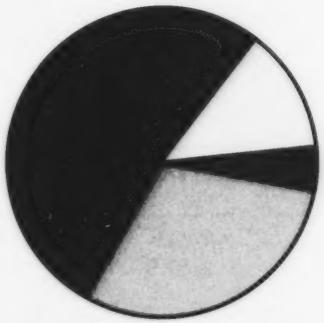
CURRENT EXPENDITURES OF THE PROVINCIAL GOVERNMENT ON R&D AND RSA BY PERFORMER

Activity	Intramural	Industry	Universities	Hospitals & Health Organizations	Alberta Research Council	Other*	Total
				($'000)			
Research & Development							
In-house	20,832	—	—	—	—	—	20,832
Contracts	783	72,154	5,100	—	8,267	1,795	88,099
Grants	—	10,758	84,005	18,710	22,754	5,633	141,860
Research Fellowships	—	—	358	—	—	75	433
	21,615	82,912	89,463	18,710	31,021	7,503	251,224
Related Scientific Activities	58,251	8,394	1,720	—	2,744	3,419	74,528
TOTAL	79,866	91,306	91,183	18,710	33,765	10,922	325,752

*includes nonresident performers and the Federal Government

FIGURE 1

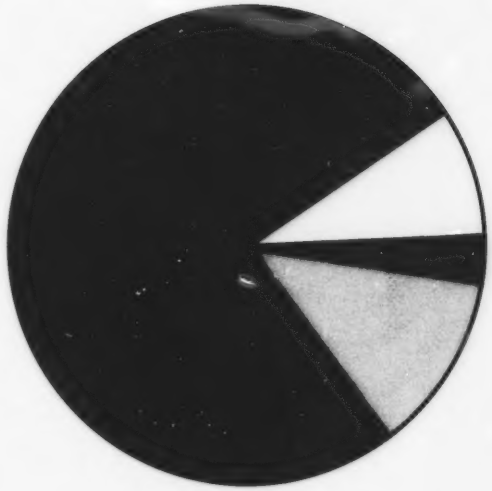
PERFORMERS OF GOVERNMENT SPONSORED R&D AS A PROPORTION OF TOTAL R&D EXPENDITURES FOR 1981/82 AND 1986/87



1981/82 R&D Expenditures: $94.0 million

LEGEND

- Intramural 13.9%
- Industry 30.7%
- Universities 9.7%
- Hospitals 13.6%
- ARC 28.4%
- Other 3.6%



1986/87 R&D Expenditures: $251.2 million

LEGEND

- Intramural 8.6%
- Industry 33%
- Universities 35.6%
- Hospitals 7.4%
- ARC 12.3%
- Other 3%

IV. EXPENDITURE BY MAJOR FUNDING AGENCY

As revealed in Table III, three agencies, AOSTRA (Alberta Oil Sands Technology Research Authority), the Alberta Heritage Foundation for Medical Research (AHFMR), and Technology, Research and Telecommunications (TRT) account for $190.9 million or 58 percent of Alberta's total expenditures on scientific activities.

Moreover, with the exception of TRT's allocation to the Alberta Research Council, these three agencies spend in excess of 90 percent of their budgets for scientific activities in the industry and university sectors. As noted earlier, the bulk of the Province's intramural expenditures relate to RSA and this is reflected in the technical, statistical, information, and museum services offered by the other major funding departments/agencies. Note, however, that if priorities can be discerned from expenditure patterns, medicine (health care) and energy are clearly the focus of Alberta science policy.

TABLE III

TOTAL EXPENDITURES OF THE PROVINCIAL GOVERNMENT ON SCIENTIFIC ACTIVITIES, BY SECTOR OF PERFORMANCE AND BY MAJOR DEPARTMENT, 1986-87

Department or Agency	Intramural	Industry	Universities	Hospitals & Health Organizations ($'000)	Alberta Research Council	Other	Total
Agriculture	10,788	813	2,320	—	704	2,528	17,153
Culture	15,930	2,646	—	—	—	1,022	19,598
Environment	9,837	3,924	488	—	1,046	1,189	16,484
Alberta Environmental Centre	11,670	—	—	—	—	42	11,712
Forestry, Lands & Wildlife	6,146	1,024	405	—	1,185	—	8,760
Alberta Heritage Foundation for Medical Research	—	—	54,304	—	—	2,626	56,930
Hospitals and Medical Care	2,154	84	3,625	18,566	—	261	24,690
AOSTRA	3,725	64,886	3,929	—	5,349	1,028	78,917
Technology, Research & Telecommunications	156	9,180	22,269	—	23,357	130	55,092
Other	23,066	8,749	3,843	144	2,124	2,096	40,022
TOTAL	83,472	91,306	91,183	18,710	33,765	10,922	329,358

V. OBJECTIVES OF EXPENDITURE

The objectives served by the Government of Alberta's expenditures on scientific activities are reflected in Table IV.

TABLE IV

OBJECTIVES OF PROVINCIAL GOVERNMENT EXPENDITURES ON SCIENTIFIC ACTIVITIES

Objective	FY 86/87		FY 81/82*	
	($ M)	(% of Total)	($ M)	(% of Total)
Advancement of Science	10.1	(3.1)	8.0	(4.8)
Energy & Fuels	77.3	(23.5)	49.4	(29.9)
Environment	19.6	(6.0)	12.1	(7.3)
Health	88.3	(26.8)	33.6	(20.3)
Industry & Economic Development				
— Agriculture	21.3	(6.5)	18.3	(11.1)
— Fisheries	0.7	(0.2)	N/A	(N/A)
— Forestry	5.1	(1.5)	4.0	(2.4)
— Manufacturing	55.6	(16.9)	16.1	(9.7)
— Minerals	0.5	(0.2)	0.9	(0.5)
— Other	6.2	(1.9)	N/A	N/A
	89.5	(27.2)	39.3	(23.8)
Social Development	35.6	(10.8)	14.9	(9.0)
Other	9.0	(2.7)	8.1	(4.9)
	329.4	(100.0)	165.4	(100.0)

*reconstructed from the 1981-82 survey

Slightly over one-half of the Government's scientific expenditures in 1986-87 ($165.6 million) were devoted to the fields of energy and health. While constituting virtually the same proportion of total expenditures five years earlier, it is significant that the annual growth rate in expenditures on health care has been more than double that on energy (21.3 percent vs 9.4 percent) and, as a consequence, health care now commands a larger share of the total science budget than energy. It should also be noted that the priority commanded by these two areas is further attested to by the specialized entities that the government has created for their exploitation; namely, AOSTRA and AHFMR. These two entities represent nearly 75 percent of the $165.6 million devoted to energy and health care science activities. As a parenthetical note, AOSTRA also funds the bulk of the noted "advancement of science" activities, thus explaining the apparent anomaly of its budget exceeding the total expenditures on energy.

Expenditures on other scientific objectives have remained relatively constant, the exception being a marginal increase in the proportion of resources devoted to "industrial and economic development" ($89.5 million or 27.2 percent of total expenditures in 1986/87 vs $39.3 million or 23.8 percent in 1981/82). Of greater significance, however, is the obvious increase in emphasis accorded manufacturing as opposed to agriculture. Indeed, expenditures devoted to manufacturing applications have increased at an average annual rate of 28 percent to $55.6 million whereas expenditures for agricultural applications have increased at only 3 percent annually to $21.3 million. As of 1986/87, scientific expenditures on manufacturing had clearly replaced agriculture as the priority area within the "industry and economic development" portfolio.

VI. HUMAN RESOURCES

The intramural RSA and R&D expenditures indicate an active corps of scientific research personnel within the public service. The annual survey estimates the size of the in-house research complement as 1,760 science professionals and technicians. This represents about 6% of the provincial government labour force.

As expected, one out of three scientific personnel are engaged in R&D. The R&D performers are concentrated in four departments/agencies associated with natural sciences: Agriculture; Environment; Forestry; Lands, and Wildlife and AOSTRA. The distribution of science personnel within the provincial government is shown in Table V.

TABLE V

LOCATION OF SCIENTIFIC PERSONNEL WITHIN THE PROVINCIAL GOVERNMENT, BY ACTIVITY

Department/Agency	R&D	RSA	Total
	(in person years)		
Environment*	152	313	465
Agriculture	130	278	408
AOSTRA	51	—	51
Forestry, Lands & Wildlife	34	74	108
Culture	32	143	175
Transportation	13	87	100
Municipal Affairs	7	58	65
Economic Development	—	64	64
Others	34	191	367

*Department and Alberta Environmental Centre at Vegreville

VII. COMPARISONS

As with other science and technology indicators, the most direct measure of scientific activity is the actual dollar value of committed resources. The most direct measure is the most valid basis for comparisons. Eight provinces participate in the annual Statistics Canada survey of provincial government expenditures on scientific activities. Table VI gives the provincial total expenditures where final results of the 86/87 survey are available.

TABLE VI

1986/87 PROVINCIAL GOVERNMENT EXPENDITURES ON SCIENTIFIC ACTIVITIES

Province	Total Expenditures ($ millions)	Natural Sciences R&D Expenditures ($ millions)
Manitoba	44.9	7.2
Saskatchewan	75.0 (e)	39.0 (e)
British Columbia	92.7	26.1
New Brunswick*	19.7	8.6
Newfoundland	25.0	0.6
Ontario**	234.1	90.5
Alberta	329.4	245.4

* does not include social sciences funding in annual survey.
**these are estimates for 86/87 as reported in 85/86 survey; actual expenditures were not available.

It is readily apparent that the Alberta Government's expenditures on science and technology is an order of magnitude greater than other provincial governments in 86/87. This has been a consistent trend in the '80s.

Another point of interest in science and technology statistics is channelling of public dollars to industry R&D. Both levels of government fund Alberta industry R&D. Table VII shows the federal and provincial government allocations to Alberta industry R&D in the natural sciences for 85/86, the latest year available.

TABLE VII

NATURAL SCIENCES R&D PERFORMED BY ALBERTA INDUSTRY AND FUNDED BY THE PUBLIC SECTOR, 1985-1986

	Federal ($ millions)	Provincial ($ millions)
R&D Grants	$ 7.0	$ 1.3
R&D Contracts	6.0	42.7
Total	13.0	44.0

The federal government grants stem from the Industrial and Regional Development Program of the Department of Regional Industrial Expansion (DRIE) and the Industrial Research Assistance Program of the National Research Council. The provincial government contracts were awarded primarily by AOSTRA ($39.1 million). With regard to total funding of industry R&D, the provincial government advanced about $3.50 dollars to $1.00 of federal funding.